

WHAT IS CLAIMED IS:

1. An intradermal delivery device, comprising:
a housing including a base defining a needle aperture and a skin-engaging surface
extending about a periphery of the needle aperture;
5 a syringe including a syringe body coupled to the housing and a plunger slidably received
within the syringe body;
a needle coupled in fluid communication with the syringe body and movable through the
needle aperture to penetrate the skin and inject a substance contained within the syringe body
therein;
10 a vacuum chamber coupled in fluid communication with the base for drawing a vacuum
within the base and, in turn, releasably securing the skin-engaging surface to the skin and forming
a substantially planar needle penetration region on the skin;
at least one stop surface fixed relative to at least a portion of the skin-engaging surface to
define a predetermined distance therebetween, and adapted to cooperate with the needle to limit a
15 depth of insertion of the needle into the needle penetration region of the skin, wherein the needle is
movable through the needle aperture upon slidably moving the plunger through the syringe body
to thereby penetrate with the needle the penetration region of the skin and inject a substance
contained within the syringe body therein.
- 20 2. An intradermal delivery device as defined in claim 1, wherein the needle is non-
coring and defines least one opening in a side wall thereof.
3. An intradermal delivery device as defined in claim 2, wherein the non-coring
needle includes at least two side openings located in approximately opposite sides of the needle
25 relative to each other.
4. An intradermal delivery device as defined in claim 2, wherein the at least one stop
surface locates the at least one needle opening at a predetermined depth with the opening located
substantially entirely within the derm.

5. An intradermal delivery device as defined in claim 1, wherein the skin-engaging surface is oriented at an acute angle relative to an axis of the intradermal delivery device.

6. An intradermal delivery device as defined in claim 5, wherein the acute angle is
5 within the range of about 30° to about 60° relative to the axis of the intradermal delivery device.

7. An intradermal delivery device as defined in claim 5, wherein the acute angle is about 45° relative to the axis of the intradermal delivery device.

8. An intradermal delivery device as defined in claim 1, wherein the syringe body is
10 slidably mounted within the housing to move the needle between retracted and skin-penetrating positions.

9. An intradermal delivery as defined in claim 1, wherein the housing further defines a
15 rest axially spaced adjacent to the base for receiving a digit of a user for stabilizing the base against the skin.

10. An intradermal delivery device as defined in claim 1, wherein the syringe is axially
movable within the housing, and the at least one stop surface is positioned to engage the syringe
20 and prevent further axial movement of the syringe.

11. An intradermal delivery device as defined in claim 1, further comprising a needle
cap mounted over the needle and forming an approximately airtight seal therebetween, and
defining a penetrable surface formed adjacent to the needle tip for passage of the needle
25 therethrough.

12. An intradermal delivery device as defined in claim 11, wherein the syringe, needle
and needle cap form a sealed, pre-fillable subassembly insertable into the housing after filling the
syringe body with a substance.

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13. An intradermal delivery device as defined in claim 11, wherein the needle is a non-coring needle defining a closed end surface and at least one aperture located in a side wall thereof in fluid communication with the syringe body.

5 14. An intradermal delivery device as defined in claim 1, further comprising a removable locking member attachable to the syringe for preventing actuation of the intradermal delivery device prior to removal thereof.

10 15. An intradermal delivery device as defined in claim 1, further comprising a pair of first and second finger grips formed on the housing on approximately opposite sides of the plunger relative to each other for receiving digits of a first hand, and a third finger grip formed on the housing adjacent to the base for receiving a digit of a second hand for controlling application of the intradermal delivery device to the skin.

15 16. An intradermal delivery device as defined in claim 15, wherein the first and second finger grips are positioned for receiving an index and middle finger, respectively, and the plunger defines a surface for receiving a thumb of the first hand.

20 17. An intradermal delivery device as defined in claim 1, wherein the base defines at least one aperture formed adjacent to the skin-engaging surface and coupled in fluid communication with the vacuum chamber for drawing a vacuum through the at least one aperture and releasably securing the skin-engaging surface to the skin.

25 18. An intradermal delivery device as defined in claim 17, wherein the at least one aperture extends adjacent to a periphery of the skin-engaging surface.

30 19. An intradermal delivery device as defined in claim 17, wherein the base defines at least one first recess spaced on an opposite side of the vacuum aperture relative to the needle aperture and adapted to receive therein a sealant to facilitate the formation of a vacuum within the vacuum aperture and releasably securing the skin-engaging surface to the skin.

20. An intradermal delivery device as defined in claim 19, wherein the at least one first recess defines a first approximately annular groove.

21. An intradermal delivery device as defined in claim 19, wherein the base further
5 defines at least one second recess located between the needle aperture and the vacuum aperture for receiving therein a sealant to facilitate the formation of a vacuum within the vacuum aperture and releasably securing the skin-engaging surface to the skin.

22. An intradermal delivery device as defined in claim 1, wherein the housing includes
10 first and second parts, wherein at least one of the first and second parts is movable relative to the other to create a vacuum within the vacuum chamber.

23. An intradermal delivery device as defined in claim 22, wherein the syringe body is
movable within the housing, and at least one of the first and second parts is movable relative to the
15 other with movement of the syringe body to create a vacuum within the vacuum chamber.

24. An intradermal delivery device as defined in claim 23, wherein the syringe body is
movable within the housing upon moving the plunger relative to at least one of the syringe body
and housing.

25. An intradermal delivery device as defined in claim 22, wherein the first part
includes a peripheral sealing member that slidably contacts the second part and forms a
substantially gas-tight seal therebetween to create a vacuum within the vacuum chamber.

26. An intradermal delivery device as defined in claim 25, wherein the peripheral
25 sealing member is defined by a polymeric flange formed on the first part, and the second part defines an axially elongated polymeric surface, and the flange is slidably engageable with the axially-elongated surface to form a substantially gas-tight seal therebetween.

27. An intradermal delivery device as defined in claim 19, wherein the sealant includes
30 at least one of an antibacterial, anti-septic, and anesthetic substance.

28. An intradermal delivery device as defined in claim 1, further comprising a sleeve that extends axially adjacent to the plunger and is spaced radially therefrom for receiving at least a portion of the syringe body therebetween to protect the syringe body in a retracted position.

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29. An intradermal delivery device as defined in claim 1, wherein the base defines a first skin-engaging surface formed adjacent to the needle aperture, and a second skin-engaging surface spaced radially outwardly relative to the first skin-engaging surface, and wherein the first skin-engaging surface is spaced axially inwardly relative to the second skin-engaging surface to facilitate radially directed skin movement relative to the first skin-engaging surface and formation of the substantially planar needle penetration region on the skin.

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30. A method for intradermal delivery, comprising the following steps:

providing an intradermal delivery device including a housing having a mounting surface and a reciprocally mounted syringe therein;

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placing the mounting surface on the skin of a patient;

creating a vacuum between the housing and the skin and, in turn, releasably securing the mounting surface to the skin;

forming a substantially planar target penetration region on the skin;

introducing a needle of the syringe a predetermined depth into the substantially planar target penetration region of the skin; and

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injecting a substance from the syringe through the needle into the substantially planar target penetration region of the skin.

31. A method as defined in claim 30, further comprising the step of providing a non-coring needle defining at least one lateral opening in a side wall thereof; introducing the needle into the target penetration region of the skin at a predetermined depth wherein the at least one lateral opening is located substantially entirely within the derm; and injecting the substance laterally through the at least one opening of the needle and into the derm.

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32. A method as defined in claim 31, further comprising the step introducing the needle at a predetermined acute angle between the axis of the needle and the substantially planar target penetration region of the skin.

5 33. A method as defined in claim 31, wherein the step of forming a substantially planar target penetration region on the skin includes tensioning the skin.

34. An intradermal delivery device, comprising:
first means for defining a substantially planar needle penetration region on the skin;
10 second means for releasably securing by vacuum the first means to the skin and preventing relative movement of the needle penetration region of the skin and the first means;
third means for storing a substance to be injected into the skin;
fourth means for releasing the substance from the third means; and
fifth means in communication with the third means for penetrating the substantially planar
15 needle penetration region of the skin and injecting the substance contained within the third means therein.

35. An intradermal delivery device as defined in claim 34, further comprising a housing including a base defining a skin-engaging surface and a needle aperture formed adjacent
20 thereto, wherein the first means is defined by the skin-engaging surface and a vacuum chamber coupled in fluid communication with the skin-engaging surface for tensioning skin located within the skin-engaging surface and forming the approximately planar needle penetration region thereon.

36. An intradermal delivery device as defined in claim 34, wherein the second means is
25 defined by a vacuum chamber.

37. An intradermal delivery device as defined in claim 34, further comprising a syringe including a syringe body defining a chamber, wherein the third means is defined by the chamber.

38. An intradermal delivery device as defined in claim 34, wherein the fourth means is
30 a plunger slidably received within the third means.

39. An intradermal delivery device as defined in claim 34, wherein the fifth means is a needle.

5 40. An intradermal delivery device as defined in claim 34, wherein the first skin-engaging surface is approximately annular and extends about a periphery of the needle aperture, and the device further includes a second approximately annular skin-engaging surface radially spaced relative to the first skin-engaging surface, and wherein the vacuum chamber is coupled in fluid communication between the first and second skin-engaging surfaces for forming a vacuum
10 therein.

41. An intradermal delivery device as defined in claim 35, wherein an axis of the housing forms an oblique angle with respect to the substantially planar needle penetration region.

15 42. An intradermal delivery device as defined in claim 35, wherein the housing forms a groove about the substantially planar needle penetration region for receiving a sealant.

43. An intradermal delivery device as defined in claim 42, wherein the sealant includes at least one of an anti-septic agent, an anti-bacterial agent, an alcohol, and an anesthetic agent.

20 44. An intradermal delivery device as defined in claim 39, wherein the needle defines a beveled tip, and the device further comprises a needle mount for coupling the needle to the third means, and the needle mount includes a keyed portion for orienting the beveled tip.

25 45. An intradermal delivery device as defined in claim 34, further comprising means for limiting a depth of insertion of the fifth means into the substantially planar needle penetration region of the skin.

46. An intradermal delivery device, comprising:
30 a housing including a base defining a needle aperture and a skin-engaging surface extending about a periphery of the needle aperture;

a syringe including a syringe body coupled to the housing and a plunger slidably received within the syringe body;

a needle coupled in fluid communication with the syringe body and movable through the needle aperture to penetrate the skin and inject a substance contained within the syringe body
5 therein;

at least one stop surface fixed relative to at least a portion of the skin-engaging surface to define a predetermined distance therebetween, and adapted to cooperate with the needle to limit a depth of insertion of the needle into the needle penetration region of the skin; and

means for forming a substantially planar needle penetration region on the skin.

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47. An intradermal delivery device as defined in claim 46, wherein the means for forming a substantially planar needle penetration region on the skin is defined by at least a portion of the skin-engaging surface that is radially expandable, and wherein the needle is movable through the needle aperture upon slidably moving the plunger through the syringe body to thereby
15 penetrate with the needle the penetration region of the skin and inject a substance contained within the syringe body therein.

48. An intradermal delivery device as defined in claim 46, wherein the means for forming a substantially planar needle penetration region on the skin is defined by a vacuum
20 chamber coupled in fluid communication with the base for drawing a vacuum within the base and, in turn, releasably securing the skin-engaging surface to the skin and forming a substantially planar needle penetration region on the skin.

49. An intradermal delivery device as defined in claim 47, wherein the portion of the
25 skin-engaging surface is radially expandable in response to movement of the plunger through the syringe body.

50. An intradermal delivery device as defined in claim 47, wherein the housing defines expansion slots for facilitating radial expansion of the mounting surface.

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51. An intradermal delivery device as defined in claim 47, further comprising a needle mount for coupling the needle to the syringe body, the needle mount having a tapered wall for radially expanding the portion of the skin-engaging surface.

5 52. An intradermal delivery device as defined in claim 47, wherein an inner portion of the skin-engaging surface defines the needle aperture and is fixed relative to the radially-expandable portion of the mounting surface.